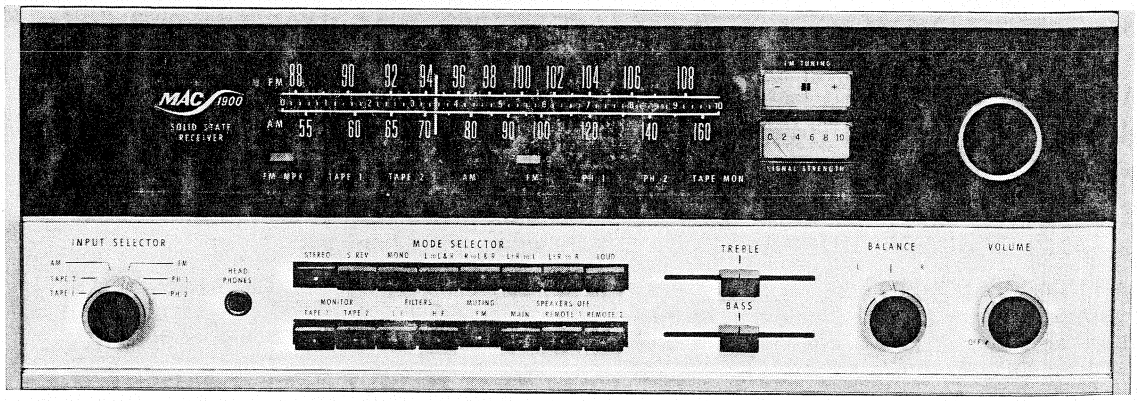
McIntosh

MAC 1900

AM/FM SOLID STATE STEREO RECEIVER



SERVICE INFORMATION

STARTING WITH SERIAL NO. AN1001

McINTOSH AUDIO DIVISION, 2 CHAMBERS STREET BINGHAMTON, NEW YORK

PERFORMANCE LIMITS

PERFORMANCE

McIntosh audio power ratings are in accordance with the Federal Trade Commission Regulation of November 4, 1974 concerning power output claims for amplifiers used in home entertainment products.

POWER OUTPUT

55 watts minimum sine wave continuous average power output, per channel, both channels operating into 8 ohm load impedance, which is:

29.98 volts RMS across 8 ohms

40 watts minimum sine wave continuous average power output, per channel, both channels operating into 4 ohm load impedance, which is:

12.5 volts RMS across 4 ohms

30 watts minimum sine wave continuous average power output, per channel, both channels operating into 16 ohms, which is:

21.9 volts RMS across 16 ohms

OUTPUT LOAD IMPEDANCE
4 ohms, 8 ohms, or 16 ohms

RATED POWER BAND
20 Hz to 20,000 Hz

TOTAL HARMONIC DISTORTION
0.2% maximum harmonic distortion at any power level from 250 millivolts to rated power per channel from 20 Hz to 20,000 Hz, both channels operating

INTERMODULATION DISTORTION
0.2% if instantaneous peak power is twice rated continuous average power or less per channel with both channels operating for any combination of frequencies 20 Hz to 20,000 Hz

FREQUENCY RESPONSE
20 Hz to 20,000 Hz +0.5 –0.5 dB at rated power

NOISE AND HUM
Power Amplifier: 95 dB below rated output
Tape Input: 90 dB below rated output
Phono Input: 76 dB below 10 mV rated power

RATINGS

DAMPING FACTOR
56 at 8 ohms output
112 at 16 ohms output

INPUT SENSITIVITY AND IMPEDANCE
Power Amplifier: 2.5 volts, 100,000 ohms
Phono 1 and Phono 2: 2.0 mV, 47,000 ohms
Tape 1 and Tape 2: 250 mV, 250,000 ohms

TAPE OUTPUT:
Tuner: 1.0 volt at 100% modulation (FM)
Tape 250 mV with rated input at 500 Hz
Phono: 1.2 volts with 1 mV at 1000 Hz

BASS CONTROLS
±16 dB at 20 Hz

TREBLE CONTROLS
±16 dB at 20,000 Hz

L. F. FILTER
Active filter, 12 dB per octave roll off below 50 Hz, down 18 dB at 20 Hz

H. F. FILTER
Active filter, 12 dB per octave roll off above 7,000 Hz, down 18 dB at 20,000 Hz

AM TUNER SECTION

SENSITIVITY
75 uV IHF (external ant.)

SIGNAL TO NOISE RATIO
45 dB minimum IHF; 55 dB at 100% modulation

HARMONIC DISTORTION
Does not exceed 1% at 30% modulation

FREQUENCY RESPONSE
3500 Hz at –6 dB down

ADJACENT CHANNEL SELECTIVITY
30 dB minimum IHF

IMAGE REJECTION
65 dB minimum, 540 kHz-1600 kHz

FM TUNER SECTION

USEABLE SENSITIVITY
2.5 microvolts at 100% modulation (±75 kHz deviation) for 3% total noise and harmonic distortion

SIGNAL TO NOISE RATIO
70 dB below 100% modulation

HARMONIC DISTORTION
MONO
Will not exceed 0.3% at 100% modulation ±75 kHz deviation
STEREO
Will not exceed 0.7%

AUDIO FREQUENCY RESPONSE
±1 dB 20 Hz to 15,000 Hz with standard de-emphasis (75μsec.) and 19,000 Hz pilot filter

CAPTURE RATIO
1.8 dB

SELECTIVITY
55 dB alternate channel selectivity IHM minmum

SPURIOUS REJECTION
90 dB IHF minimum

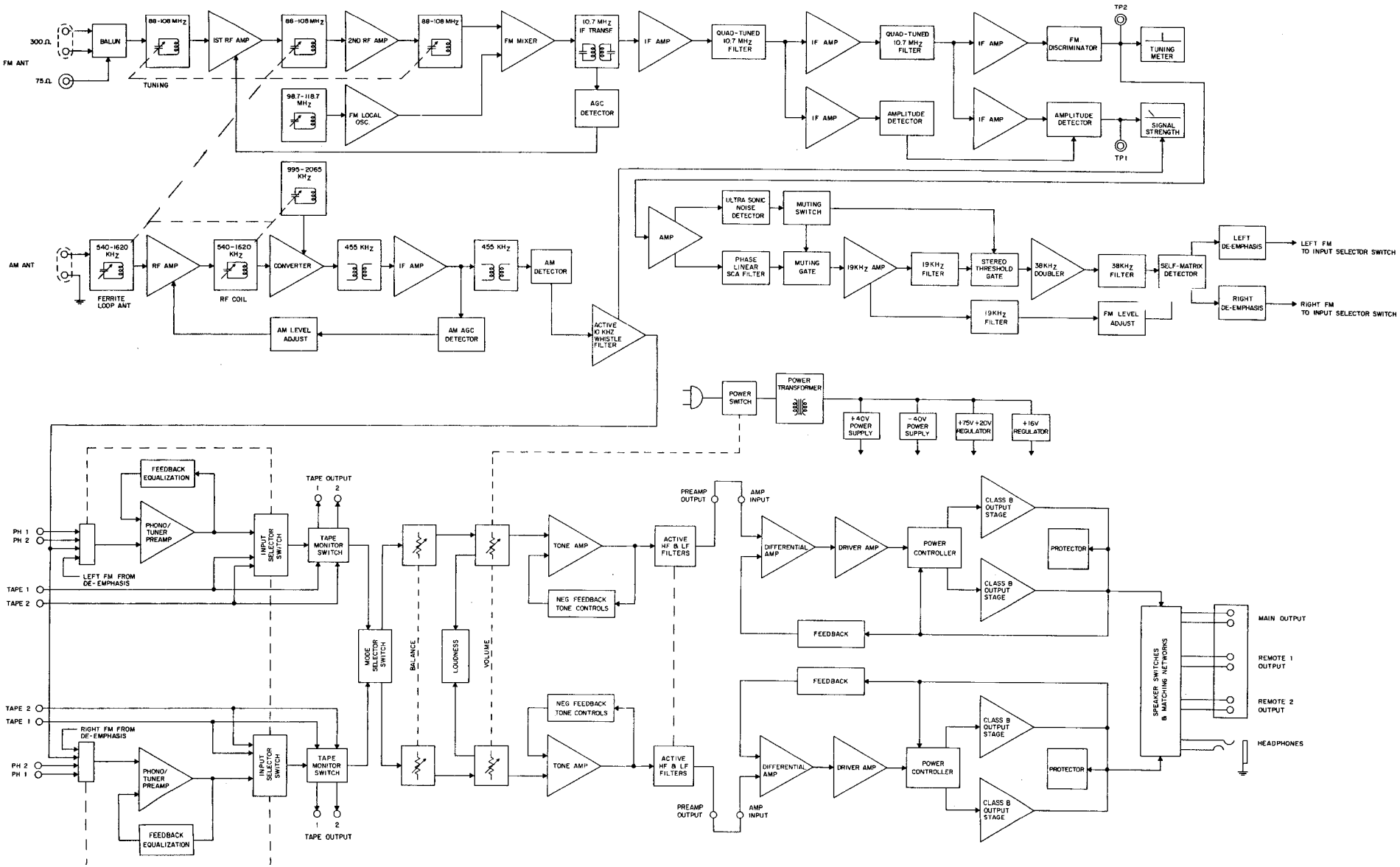
IMAGE REJECTION
80 dB; 88 to 108 kHz (IHF)

STEREO SEPARATION
34 dB at 1,000 Hz

SCA FILTER
50 dB rejection from 67 kHz to 74 kHz. 275 dB per octave slope

TRANSISTOR COMPLEMENT
53 silicon field effect or bipolar transistors, 39 diodes, 3 integrated circuits, 4 thyristors

POWER REQUIREMENTS
120 volts, 50/60 Hz, 40 watts at zero signal output, 300 watts at rated output



MAC 1900 BLOCK DIAGRAM

MAC 190(

SCHEMATIC NOTES

1. Printed circuit board components are outlined on the schematics by dotted lines. The circled numbers on the dotted lines correspond to the numbers on the printed circuit board layouts.
2. The heavy lines on the schematics denote the primary signal path.
3. The terminal numbering of rotary switches is for reference only.
4. A dot on the rotor of a rotary switch indicates that there is an electrical connection between the front and rear rotor section.
5. Unless otherwise specified: Resistance values in the AM, FM & MPX, and Preamp sections are in ohms, 1/4 watt, and 10% tolerance; resistance values in the Power Output and Power Supply sections are in ohms, 1/2 watt, 10% tolerance; capacitance values smaller than 1 are in microfarads (μF); capacitance values greater than 1 are in picofarads (pF); inductors are in microhenries (μH).
6. All voltages indicated on the schematics are measured under the following conditions:

Use of an 11 megohm input impedance VTVM.

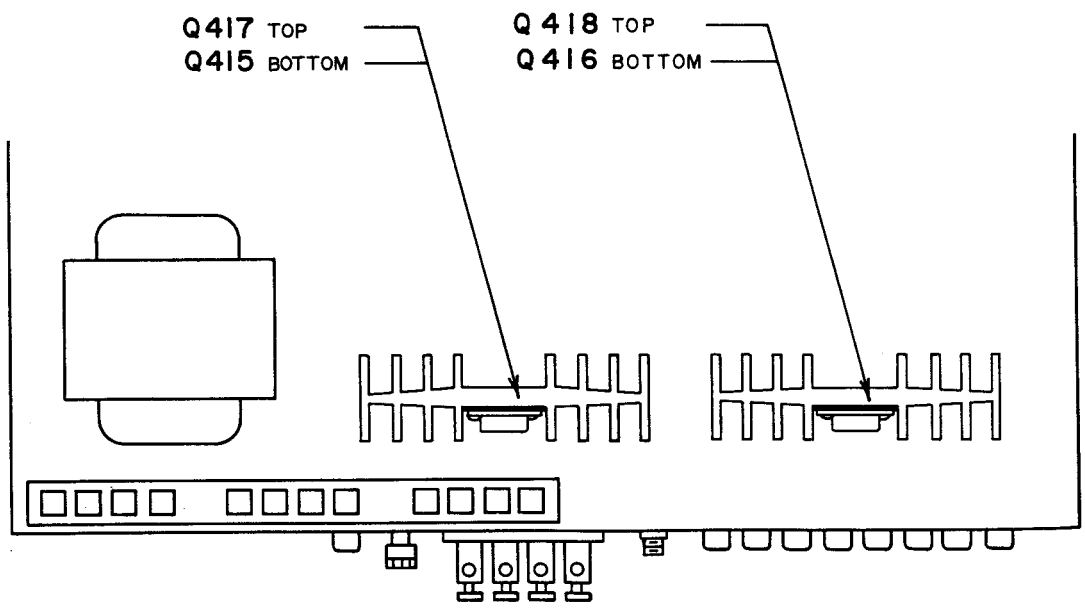
All voltages ±10% with respect to ground.

No signal at antenna or other input terminals.

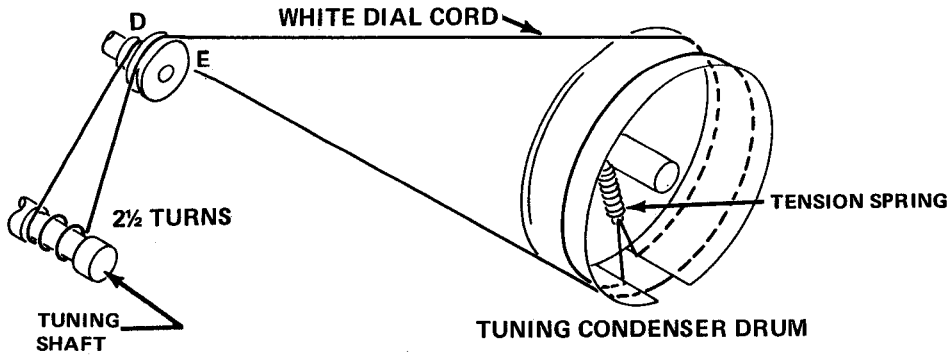
AC input at 120 volts, 50/60 Hz.

Front panel controls at:

Stereo switch	In	Muting	Out
Speaker switches	Out	Filters	Out
Volume control	Max	Loudness	Out
Balance control	Zero	Tape Monitors	Out
Tone controls	Flat	Tuning Indicator	100MHz (no signal)
Input selector	FM (to measure FM section) AM (to measure AM section)		



LOCATION OF TRANSISTORS NOT ON PC BOARD



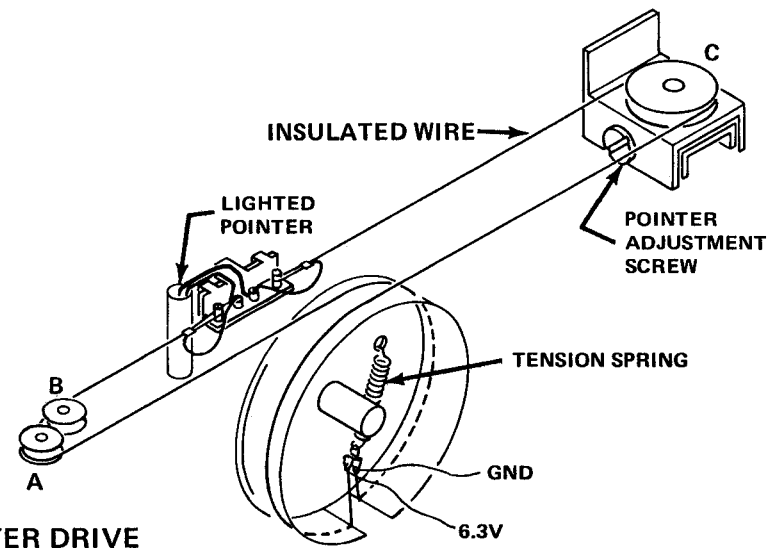
TUNING CONDENSER DRIVE

Step 1 Before stringing unit, turn pointer adjustment screw until pulley "C" is in the center of its travel.

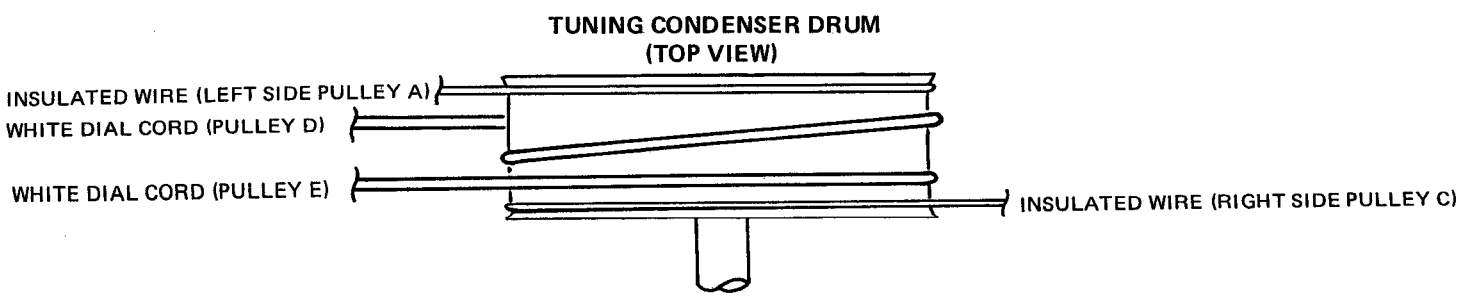
Step 2 String unit as shown.

Step 3 After stringing unit, turn tuning shaft until pointer is as far to the left as it will go. Turn the pointer adjustment screw until the pointer coincides with the zero bar of the logging scale.

Step 4 Turn the tuning knob making the pointer move back and forth from one end of the dial scale to the other. Return pointer to the far left and, if necessary, re-adjust pointer position.

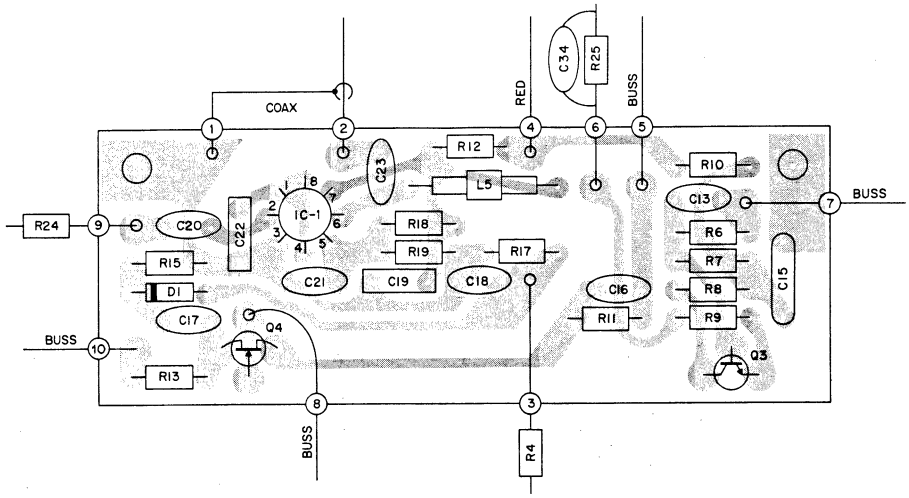


POINTER DRIVE

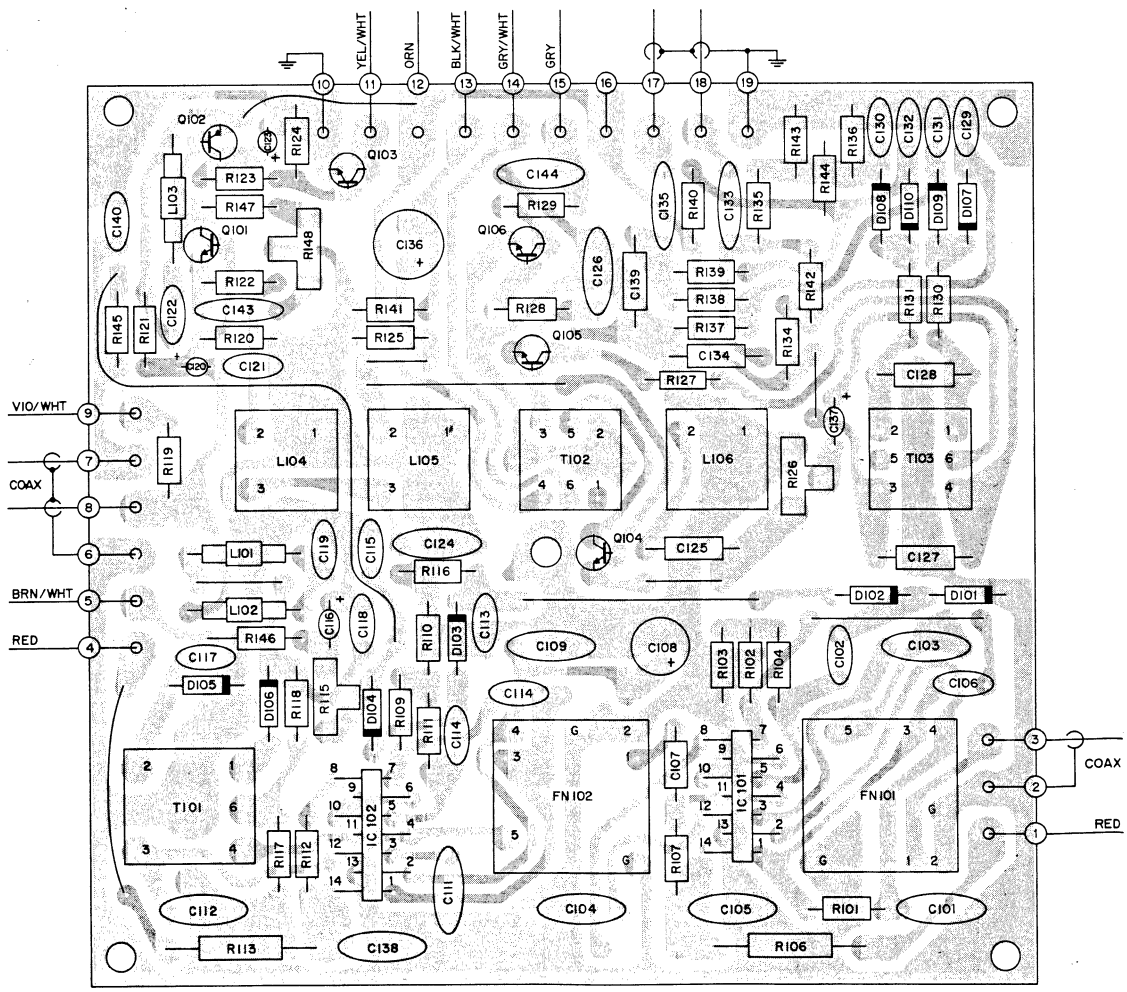

TUNING CONDENSER DRUM
(TOP VIEW)
INSULATED WIRE (LEFT SIDE PULLEY A)
WHITE DIAL CORD (PULLEY D)
WHITE DIAL CORD (PULLEY E)
INSULATED WIRE (RIGHT SIDE PULLEY C)

DIAL CORD SEQUENCE

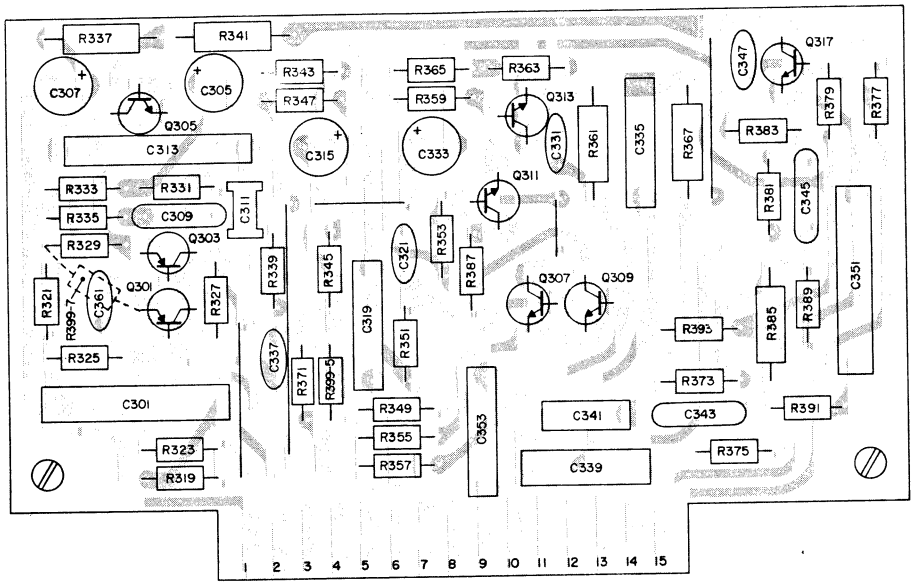
MIXER & L.O. PC BOARD 044-367



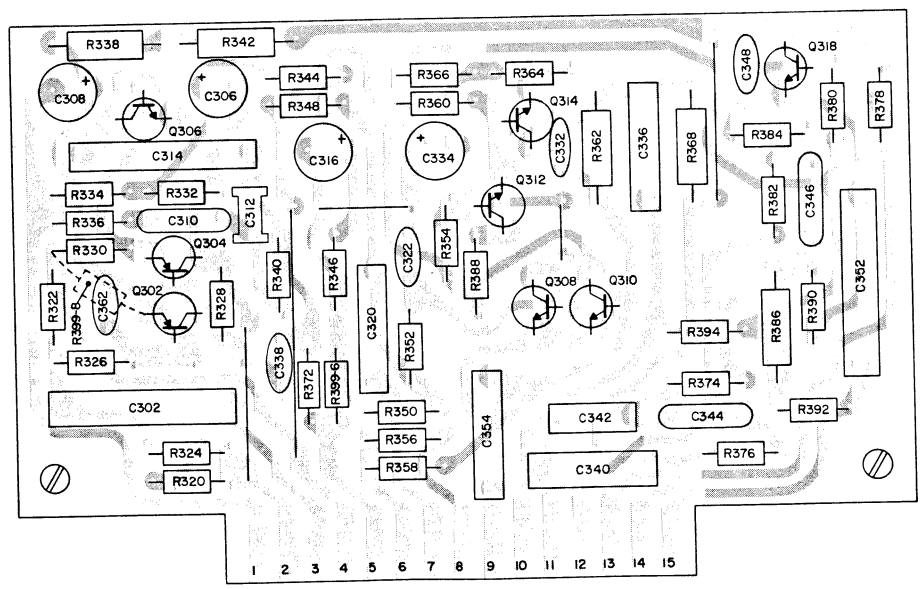
IF & MPX PC BOARD 044-343

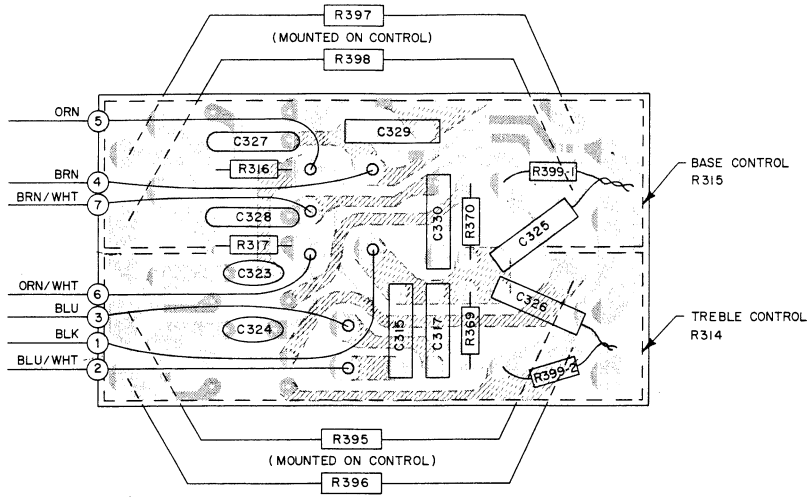


LEFT CHANNEL PREAMP PC BOARD 044-410

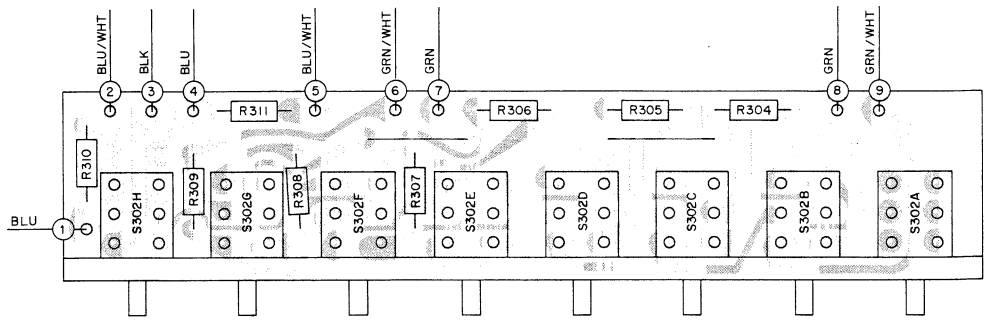


RIGHT CHANNEL PREAMP PC BOARD 044-410

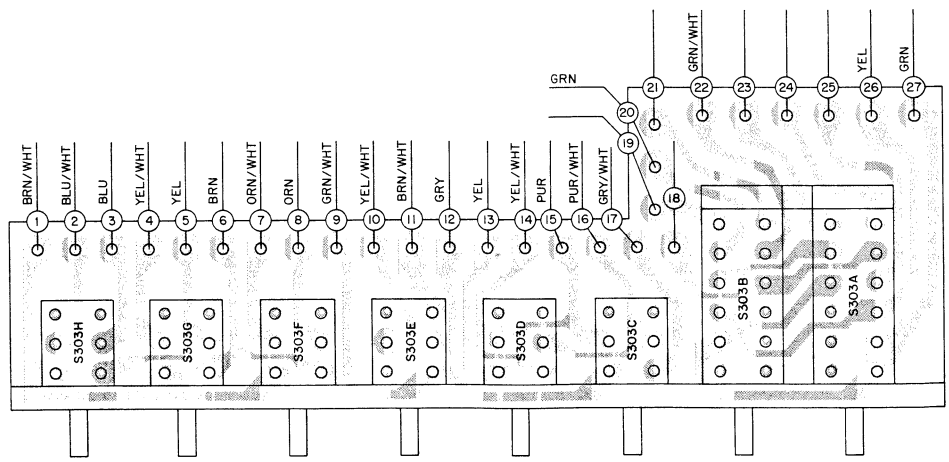




TONE CONTROL PC BOARD 044-182



MODE SELECTOR (S302) PC BOARD 044-254



MODE SELECTOR (S303) PC BOARD 044-255

PREAMP SECTION

MAC 1900 154-579

LEFT CHANNEL PREAMP
PC BOARD 044-410

RIGHT CHANNEL PREAMP
PC BOARD 044-410

MODE SELECTOR (S303)
PC BOARD 044-255

MODE SELECTOR PC BOARD 044-254
(S302)

LEFT INPUTS: TAPE 1, TAPE 2, PH 1, PH 2

RIGHT INPUTS: TAPE 1, TAPE 2, PH 1, PH 2

AM INPUT FROM PIN 6 AM PC BOARD

LEFT FM INPUT FROM PIN 18 IF-MPX PC BOARD

RIGHT FM INPUT FROM PIN 17 IF-MPX PC BOARD

S301-1 FRONT

S301-2 FRONT

S301-3 FRONT

S301-4 FRONT

S301-5 FRONT

S301-1 REAR

S301-2 REAR

S301-3 REAR

S301-4 REAR

S301-5 REAR

S301 INPUT SELECTOR

TAPE MON #1835

M301 SIGNAL STRENGTH

TAPE MONITOR

S303A

S303B

S302A STEREO

S302B STEREO REV

S302C MONO

S302D L TO L&R

S302E R TO L&R

S302F L+R TO L

S302G L+R TO R

S302H LOUDNESS

LEFT CHANNEL PREAMP
PC BOARD 044-410

RIGHT CHANNEL PREAMP
PC BOARD 044-410

MODE SELECTOR (S303)
PC BOARD 044-255

MODE SELECTOR PC BOARD 044-254
(S302)

TONE CONTROL
PC BOARD 044-182

LEFT PREAMP OUT

RIGHT PREAMP OUT

NOTE 8

S302A STEREO
S302B STEREO REV
S302C MONO
S302D L TO L&R
S302E R TO L&R
S302F L+R TO L
S302G L+R TO R
S302H LOUDNESS
S303C L.F.
S303D H.F.

FM – RF – CHASSIS

L.O. & MIXER P.C. BOARD 044-367

RF CHASSIS

FM IF-MPX P.C. BOARD 044-343

FM ANTENNA

300 Ω

75 Ω

T1

C36 100

L1 1ST RF COIL

C1A C2 1.2/10 C3 22

C4 .001

Q1 13.5V 0V

-0.1V

8V

R21 100

C32 1000

R22 100K

R1 100K

R23 100K

C24 1000

-0.1V

R2 100K

L2 2ND RF COIL

C18 C6 1.2/10 C7 22

C5 4.7

R26 470

C26 1000

13.5V

R3 100

L3 MIXER COIL

C1C C8 C9 1.2/10

C12 9 NPO

C10 1.2/10 C1D C35 9N330

C27 1000

13.5V Q2 0V

L4 FM LOCAL OSC COIL

C11 .001

0.1V

R16 100K

C37 4.7

0V

R6 8.2K

4V

R7 15K

R8 100

11.2V Q3 3.4V

C13 33

R9 100

R25 680

C34 .001

0V

0V

R10 220

C15 005

R12 680

C19 .1

R18 1K

R19 2.2K

C21 .001

10.2V

7V

10.2

IC1

3.5V

2.8V

2.8V

2.8V

0V

C22 .1

C20 4.7

0V

Q4 16V -0.1V 3.6V

C17 .001

D1

R13 68

R15 100K

R11 4.7K

C16 .001

C18 001

R17 470K

RED 16V

16V

T2

R24 100

-0.1V

R4 100K

R5 100

C28 1000

C31 1000 16V

C29 1000 -0.1V

R14 100

ORN 16V

YEL/WHT 16V

ORN

BLK/WHT

GRN/WHT

10.7 MHz I.F. FILTER 180-008

FN101

FN102

I.F. INPUT FROM OUTPUT OF RF CHASSIS

COAX 0V

R149 1K

R101 680

C101 .05

C102 100

R102 100K

R103 330

R104 1K

C103 .05

C104 .05

C105 .05

IC101

2.6V 5.4V 12.4V 0.7V 10.6V 1.4V 2.6V 5.4V

R107 2.2K

C107 4.7

R106 1.2K 1W

C106 .001

D101

D102

C108 22μF/35V

C109 .05

C110 100

IC102

2.6V 5.4V 12.4V 0.8V 5.4V 1.4V 2.6V 5.3V

R109 100K

R110 330

R111 1K

R112 3.3K

R113 220 1W

C111 .05

C138 .05

C112 .05

C114 .001

D103 D104

R116 2.2K

C113 .001

C115 .001

T101

D106

D105

C117 15

R117 10K

L101 75

L102 75

C120 1μF/35

C118 100

R118 10K

C119 100

R121 220K

C122 001

C103 1 Mh

16V

Q102

Q101 4.4V 3.8V

Q103 0.6V 0V

R143 33K

R124 10K

C123 3.3 μF/35

R120 120K 5%

R122 2.2K

R147 18K

C143 .003

MUTING ADJ. R148

L104

L105

C124 .0015

R125 3.3K

R141 100K

C136 100 μF/25

R145 680 1W

40V RED

TO PIN 7 S301-4 REAR (PREAMP SECTION)

R146 220

R115 5K

C116 1μF/35

R145 1K

C140 .001

R119 22K

C121 100

0V 0.V 0.15V 0V 0V

BRN/WHT

VIO/WHT

R108 4.7K

M101 TUNING

TP1 TP2

C142 .05

TO PIN 1 S301-4 REAR (PREAMP SECTION)

19V RED

FM & MPX SECTION

MAC 1900 154-612

L.O. & MIXER P.C. BOARD 044-367

RF CHASSIS

L4 FM LOCAL OSC COIL

IC101

IC102

Q101 Q102 Q103 Q104 Q105 Q106

T101 T102 T103

D101 D102 D103 D104 D105 D106 D107 D108 D109 D110

L101 L102 L103 L104 L105 L106

TP1 TP2

M101 TUNING

MUTING ADJ. R148

FM LEVEL

I.F. OUTPUT TO INPUT OF I.F.-MPX PC BOARD

TO PIN 12 POWER SUPPLY PC BOARD

TO RIGHT FM INPUT (PREAMP SECTION)

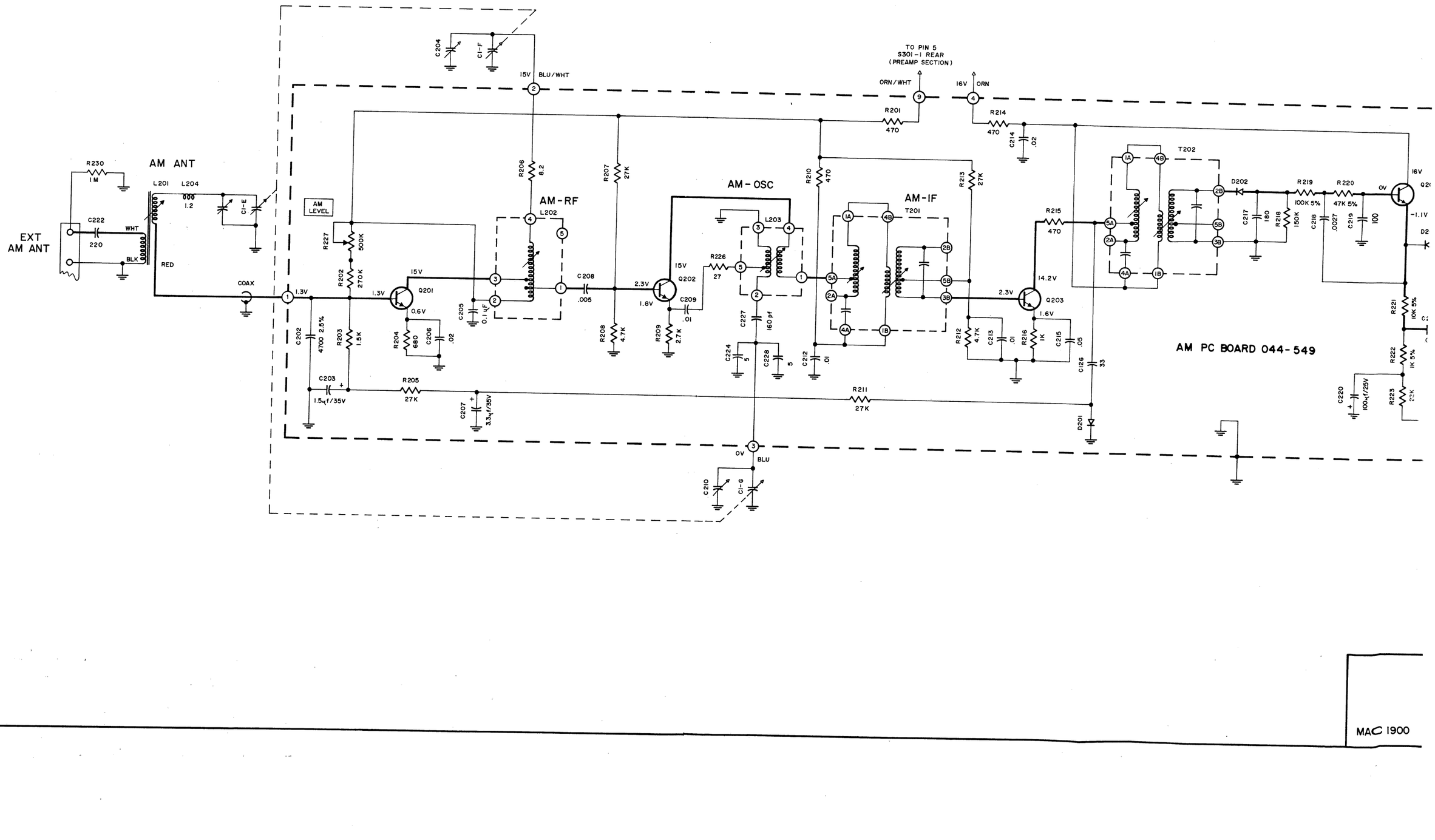
TO LEFT FM INPUT (PREAMP SECTION)

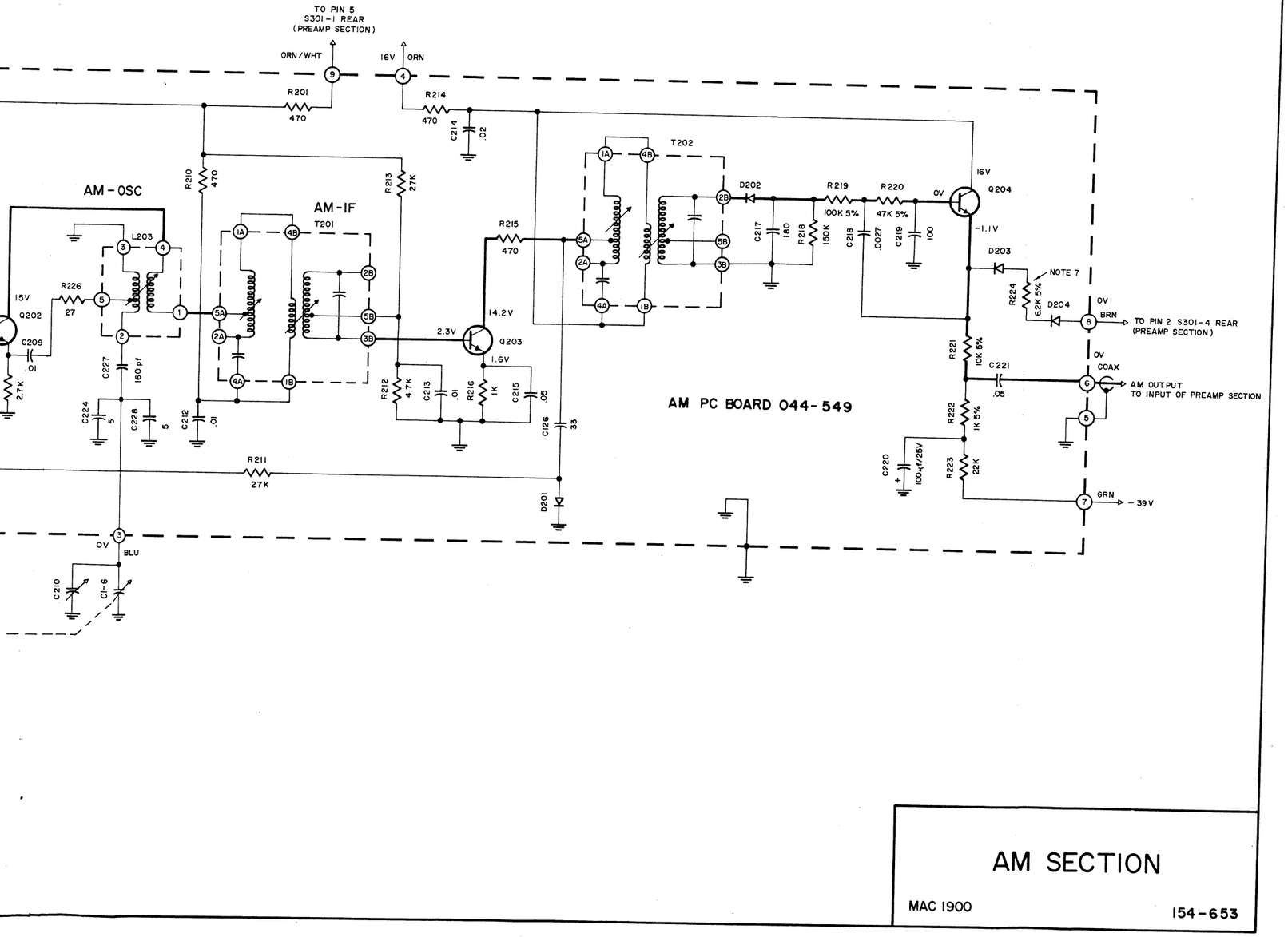
TO PIN 1 S301-4 REAR (PREAMP SECTION)

COAX

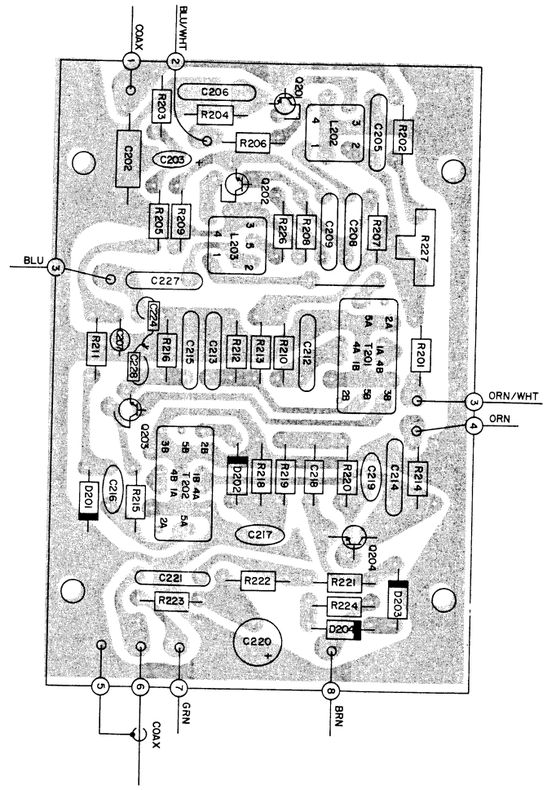
MODE SELECTOR (S303) PC BOARD 044-255

S303E


AM ANT
EXT AM ANT
R230 1M
L201
L204
1.2
C1-E
C222 220
WHT
BLK
RED
COAX
AM LEVEL
R227 500K
R202 270K
C202 4700 2.5%
R203 1.5K
C203 1.5µf/35V
R204 680
C206 .02
C205 0.1 µF
R205 27K
C207 3.3µf/35V
C204
C1-F
15V BLU/WHT
R206 8.2
AM-RF
L202
C208 .005
R207 27K
R208 4.7K
R209 2.7K
AM-OSC
L203
R226 27
C209 .01
C227 160 pf
C224 5
C228 5
R210 470
C212 .01
AM-IF
T201
R213 27K
R212 4.7K
C213 .01
R216 1K
C215 .05
C126 33
R211 27K
D201
TO PIN 5 S301-1 REAR (PREAMP SECTION)
ORN/WHT
16V ORN
R201 470
R214 470
C214 .02
R215 470
T202
D202
R219 100K 5%
R220 47K 5%
C217 180
R218 150K
C218 .0027
C219 100
16V
0V
-1.1V
R221 10K 5%
R222 1K 5%
C220 100µf/25V
R223 22K
15V
1.3V
0.6V
2.3V
1.8V
14.2V
1.6V
0V
BLU
C210
C1-G
AM PC BOARD 044-549
MAC 1900

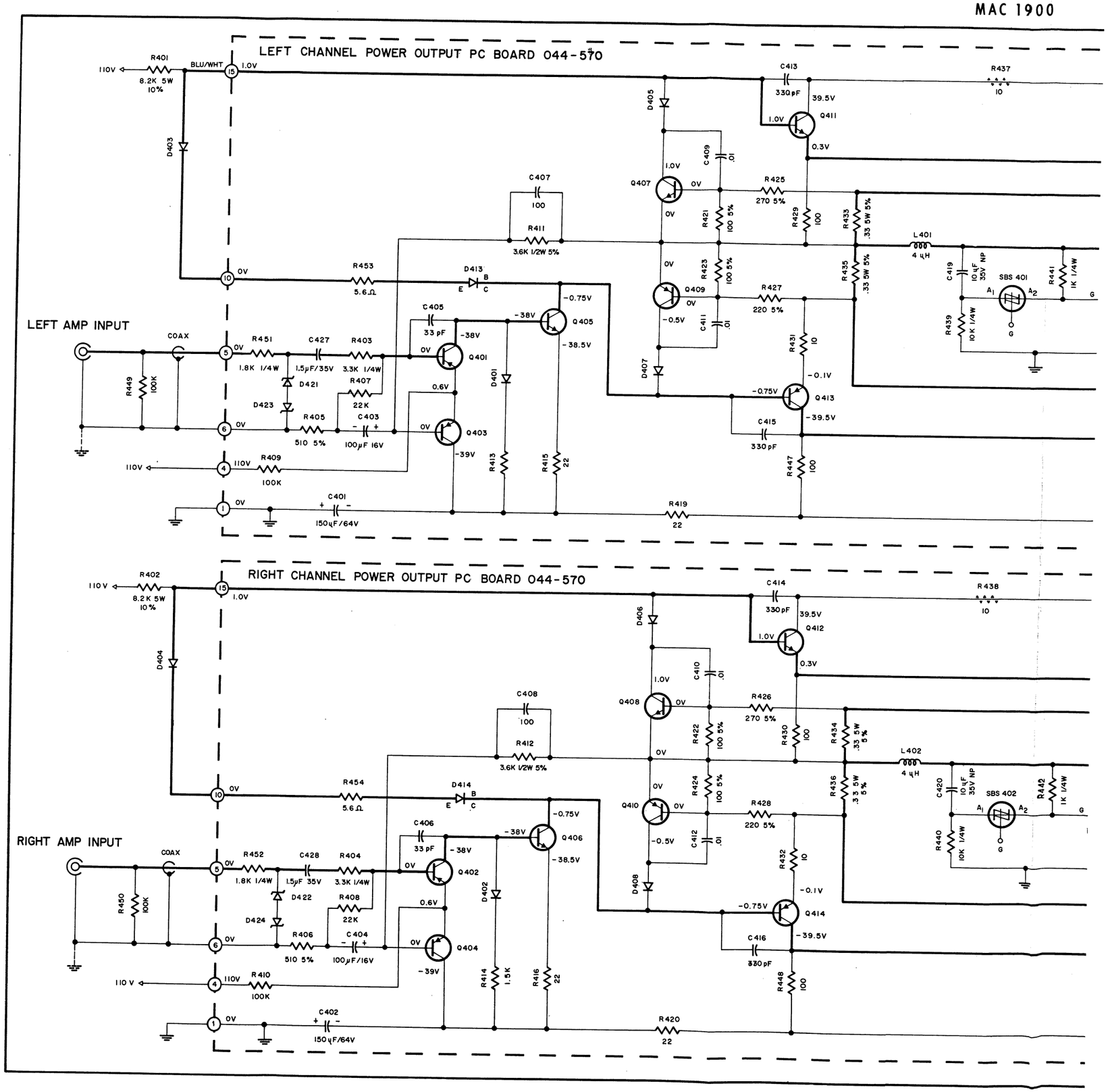


AM PC BOARD 044-549



AM SECTION

MAC 1900 154-653


LEFT CHANNEL POWER OUTPUT PC BOARD 044-570
RIGHT CHANNEL POWER OUTPUT PC BOARD 044-570
LEFT AMP INPUT
RIGHT AMP INPUT
COAX
110V
R401
8.2K 5W 10%
BLU/WHT
R402
8.2K 5W 10%
D403
D404
R403
1.8K 1/4W
R404
1.8K 1/4W
R405
510 5%
R406
510 5%
R407
22K
R408
22K
R409
100K
R410
100K
R411
3.6K 1/2W 5%
R412
3.6K 1/2W 5%
R413
R414
1.5K
R415
22
R416
22
R419
22
R420
22
R421
100 5%
R422
100 5%
R423
100 5%
R424
100 5%
R425
270 5%
R426
270 5%
R427
220 5%
R428
220 5%
R429
100
R430
100
R431
10
R432
10
R433
.33 5W 5%
R434
.33 5W 5%
R435
.33 5W 5%
R436
.33 5W 5%
R437
10
R438
10
R439
10K 1/4W
R440
10K 1/4W
R441
1K 1/4W
R442
1K 1/4W
R447
100
R448
100
R449
100K
R450
100K
R451
1.8K 1/4W
R452
1.8K 1/4W
R453
5.6Ω
R454
5.6Ω
C401
150µF/64V
C402
150µF/64V
C403
100µF 16V
C404
100µF/16V
C405
33 pF
C406
33 pF
C407
100
C408
100
C409
.01
C410
.01
C411
.01
C412
.01
C413
330pF
C414
330pF
C415
330 pF
C416
330pF
C419
10 µF 35V NP
C420
10 µF 35V NP
C427
1.5µF/35V
C428
1.5µF 35V
D405
D406
D407
D408
D413
D414
D421
D422
D423
D424
D401
D402
L401
4 µH
L402
4 µH
SBS 401
SBS 402
A1
A2
G
Q401
Q402
Q403
Q404
Q405
Q406
Q407
Q408
Q409
Q410
Q411
Q412
Q413
Q414
1.0V
0.3V
0V
-0.5V
-0.75V
-0.1V
-38V
-38.5V
-39V
-39.5V
0.6V
39.5V
1.8K 1/4W
3.3K 1/4W
1.5µF/35V
5.6Ω
1.5µF 35V
3.3K 1/4W
1.5K
10
10K 1/4W
1K 1/4W
10 µF 35V NP
.01
330pF
100
22
100K
22K
510 5%
100µF 16V
150µF/64V
33 pF
.33 5W 5%
270 5%
220 5%
100 5%
3.6K 1/2W 5%
5.6Ω
1.8K 1/4W
1.5µF/35V
3.3K 1/4W
1K 1/4W
10K 1/4W
330pF
100K
22K
510 5%
100µF/16V
150µF/64V
33 pF
.33 5W 5%
270 5%
220 5%
100 5%
3.6K 1/2W 5%
5.6Ω
1.8K 1/4W
1.5µF

WER OUTPUT PC BOARD 044-570

C413 330 pF
R437 10
D405
39.5V
Q411
1.0V
0.3V
40V 13
RED
F401 5A → 40V
D409
0.3V
Q415
40V
0V
0.3V 14
0V 12
C409 .01
1.0V
Q407
0V
R425 270 5%
C407 100
R411 3.6K 1/2W 5%
R421 100 5%
R429 100
R433 .33 5W 5%
L401 4 µH
0V 9
C425 .02
R443 15 2W
R445 220 2W
D413
C405 33 pF
-38V
-0.75V
Q405
-38.5V
Q401
0V
0.6V
Q403
-39V
D401
R413
R415 22
R423 100 5%
Q409
-0.5V
C411 .01
R427 220 5%
R435 .33 5W 5%
C419 10 µF 35V NP
SBS 401
R441 1K 1/4W
R439 10K 1/4W
TR401
D407
R431 10
-0.1V
-0.75V
Q413
-39.5V
0V 11
C415 330 pF
R447 100
-39.5V 7
0V
Q417
-39.5V
-40V
D411
R419 22
-40V 8
F402 5A → -40V

C
LEFT
C
RIGHT
MAIN SPEAKER
C
LEFT
C
RIGHT
REMOTE SPEAKERS 1
C
LEFT
C
RIGHT
REMOTE SPEAKERS 2
BRN ORN ORN/WHT YEL YEL/WHT BLU BLU/WHT
6 8 7 5 4 3 2
MODE SELECTOR (S303)
PC BOARD 044-255
BRN/WHT 1
IN IN IN
MAIN REMOTE 1 REMOTE 2
OUT OUT OUT
S303-F S303-G S303-H

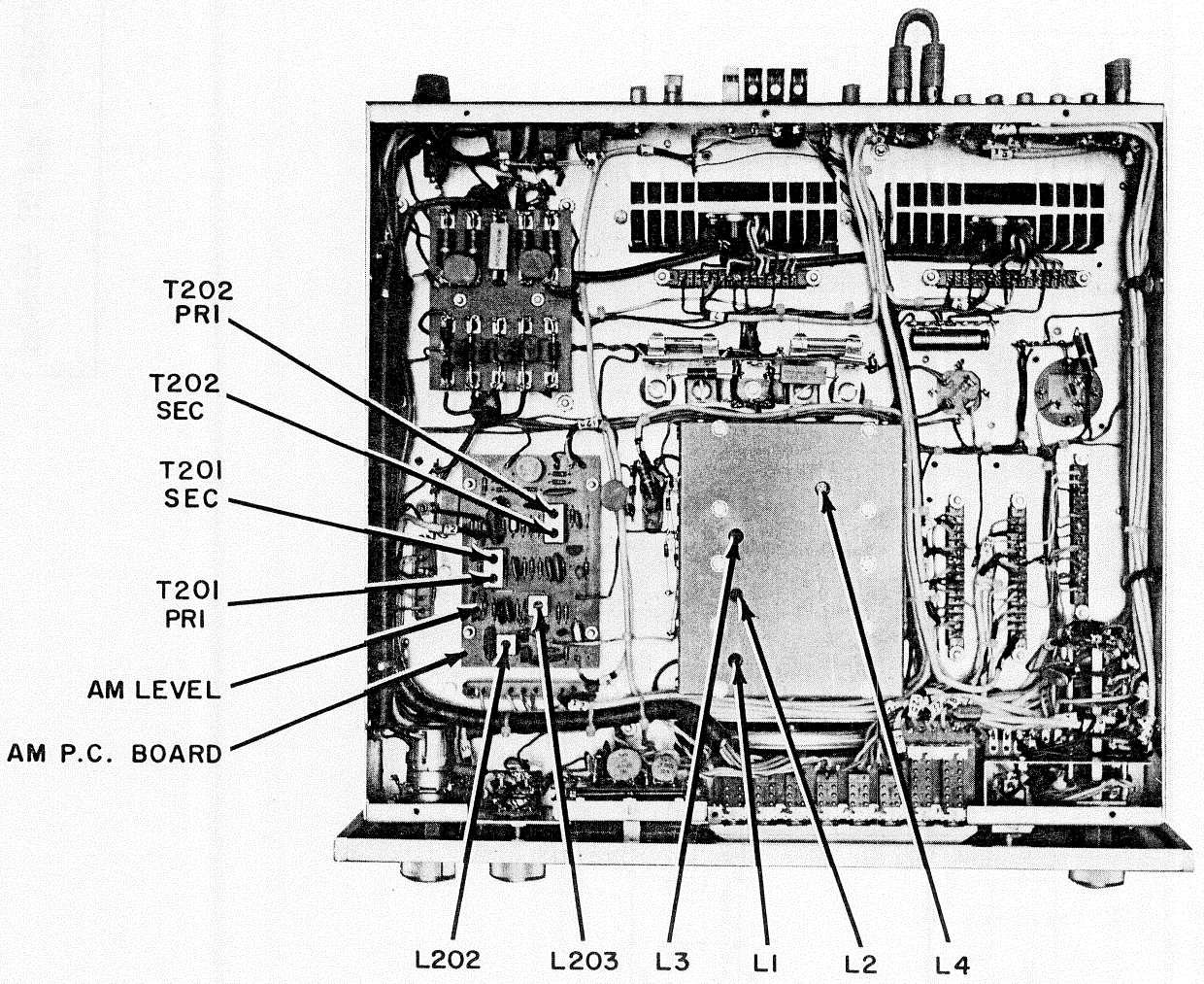
WER OUTPUT PC BOARD 044-570

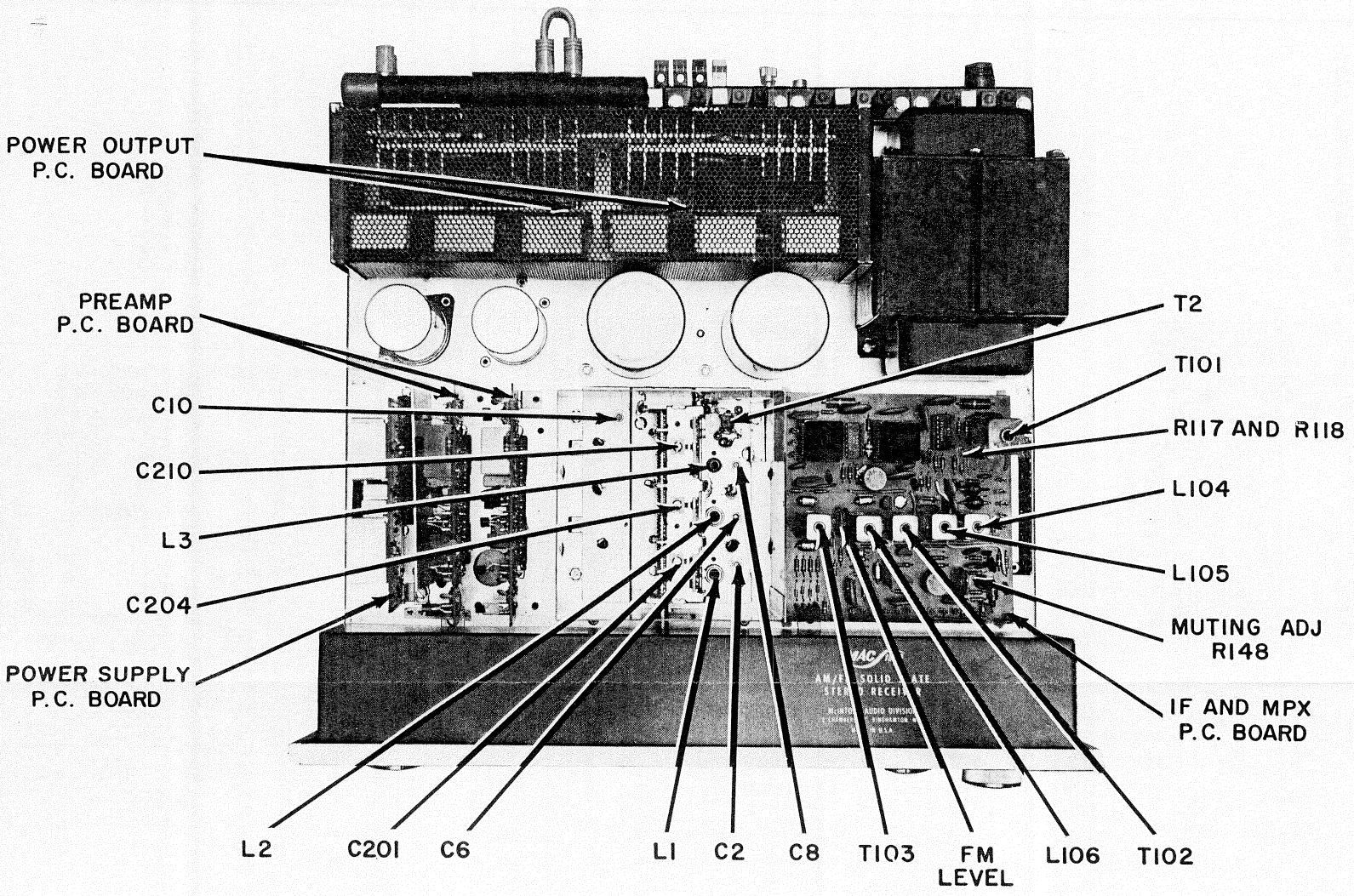
C414 330 pF
R438 10
D406
39.5V
Q412
1.0V
0.3V
40V 13
F403 5A → 40V
D410
0.3V
Q416
40V
0V
0.3V 14
0V 12
C410 .01
1.0V
Q408
0V
R426 270 5%
C408 100
R412 3.6K 1/2W 5%
R422 100 5%
R430 100
R434 .33 5W 5%
L402 4 µH
0V 9
R444 15 2W
C426 .02
R446 220 2W
HEADPHONES
D414
C406 33 pF
-38V
-0.75V
Q406
-38.5V
Q402
0V
0.6V
Q404
-39V
D402
R414 1.5K
R416 22
R424 100 5%
Q410
-0.5V
C412 .01
R428 220 5%
R436 .33 5W 5%
C420 10 µF 35V NP
SBS 402
R442 1K 1/4W
R440 10K 1/4W
TR402
D408
R432 10
-0.1V
-0.75V
Q414
-39.5V
.0V 11
.05V
C416 330 pF
R448 100
-39.5V 7
0V
Q418
-39.5V
-40V
D412
R420 22
-40V 8
F404 5A → -40V

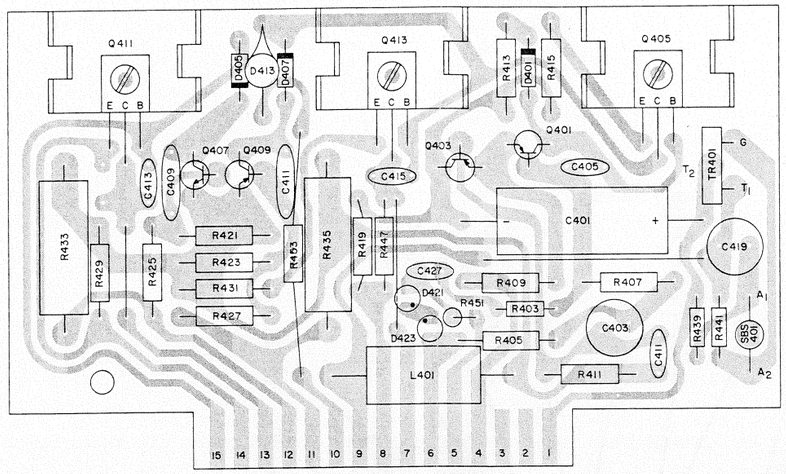
POWER OUTPUT SECTION

MAC 1900 154-654

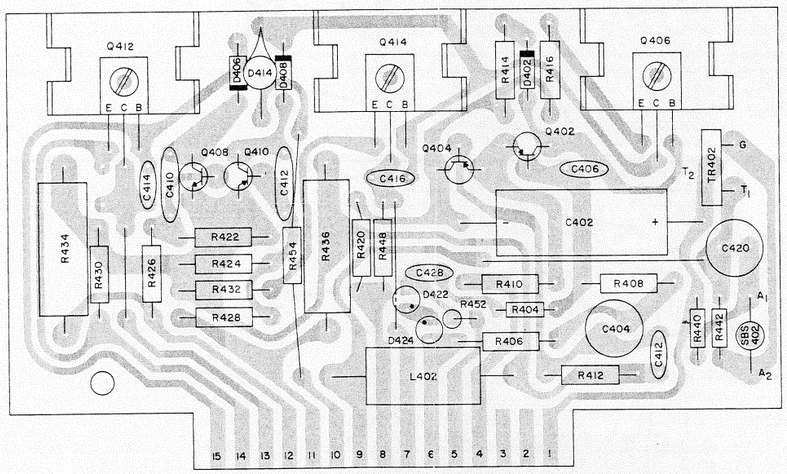
MAC 1900


T202 PRI
T202 SEC
T201 SEC
T201 PRI
AM LEVEL
AM P.C. BOARD
L202
L203
L3
L1
L2
L4

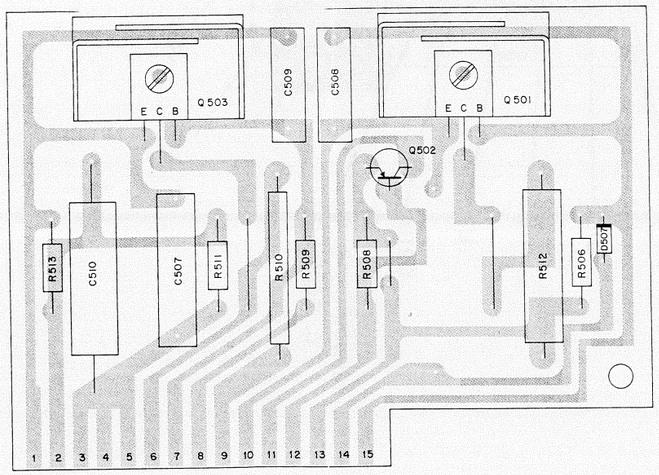

POWER OUTPUT P.C. BOARD
PREAMP P.C. BOARD
C10
C210
L3
C204
POWER SUPPLY P.C. BOARD
T2
T101
R117 AND R118
L104
L105
MUTING ADJ R148
IF AND MPX P.C. BOARD
L2
C201
C6
L1
C2
C8
T103
FM LEVEL
L106
T102



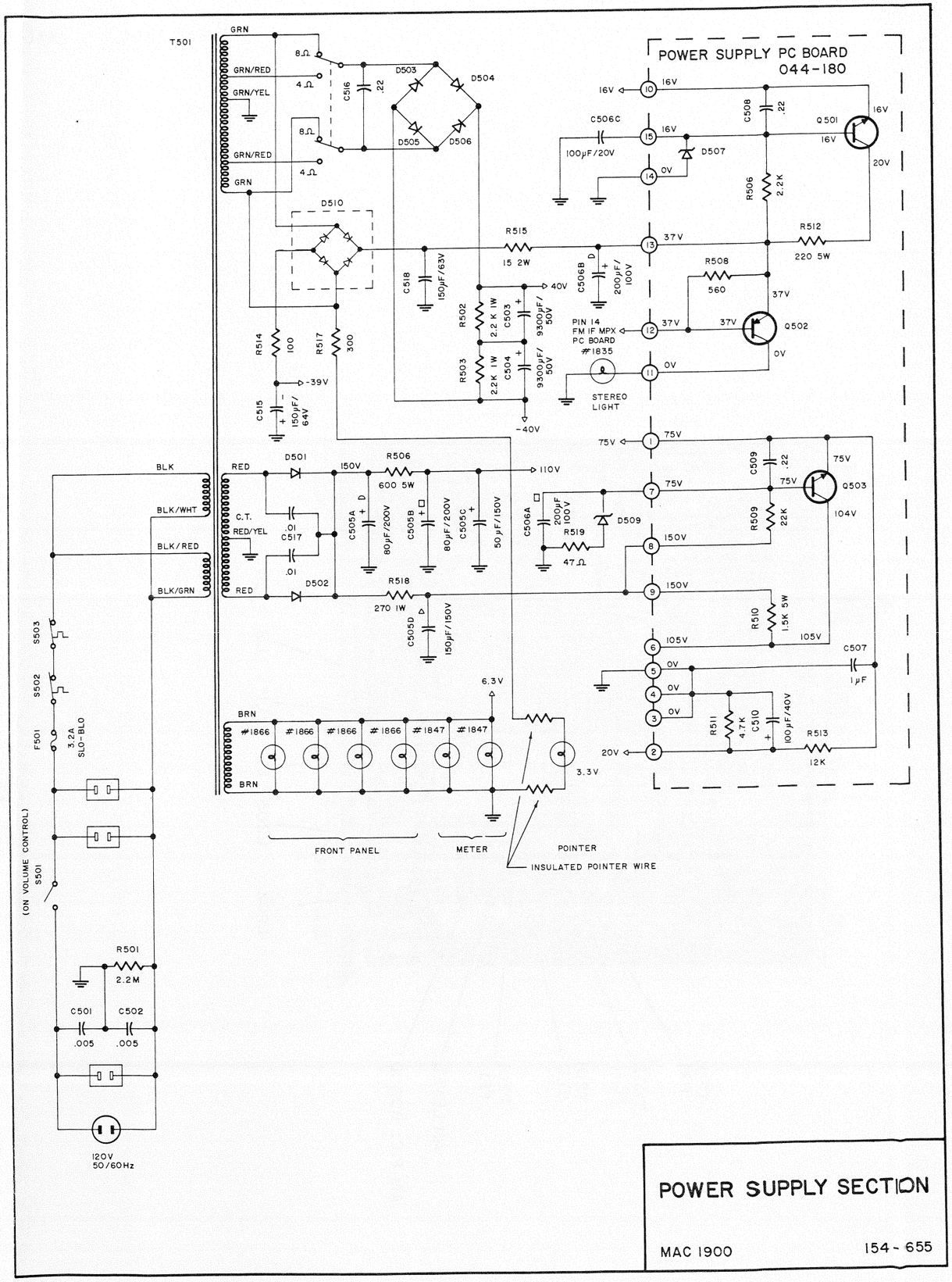
LEFT CHANNEL
POWER OUTPUT
PC BOARD 044-570



RIGHT CHANNEL
POWER OUTPUT
PC BOARD 044-570



POWER SUPPLY
PC BOARD
044-180



POWER SUPPLY SECTION

MAC 1900 154-655

MAC 1900 ALIGNMENT INSTRUCTIONS

All McIntosh receivers are carefully aligned and tested at the factory using the finest available test equipment. All McIntosh receivers will meet their published specifications when shipped from the factory.

After extensive operation, or servicing, it may be desirable to realign the receiver circuits for best performance. The charts below give complete information on the circuit realignment procedure for the MAC 1900.

The test equipment listed (or its equivalent) is necessary to properly align an MAC 1900. The accuracy of the alignment will be directly related to the accuracy and calibration of the test equipment used.

If the necessary test equipment is not available, alignment should not be attempted. For additional information, contact Customer Service Department, McIntosh Laboratory, Inc., 2 Chambers Street, Binghamton, New York 13903 (telephone 607-723-3512).

Alignment should be done in the following order: AM-FM-MPX.

TEST EQUIPMENT REQUIRED

1. FM Signal Generator (Measurement 188 or Sound Technology 1000A).
2. VTVM (RCA WV96C).
3. Multiplex Generator (Radiometer SMG1) or Sound Technology 1000A.
4. 10.7MHz Generator (preferably crystal controlled).
5. Oscilloscope (Hewlett-Packard 120B or equivalent).
6. Harmonic Distortion Analyzer (Hewlett-Packard 333A or equivalent).

AM ALIGNMENT

STEP	TUNER DIAL SETTING	SIGNAL GENERATOR			INDICATOR		ADJUST	TEST LIMITS	REMARKS
		FREQ.	COUPLING	MODULATION	TYPE	CONNECTED TO			
1	Point of no interference or signal.	455kHz	Through external .01µF capacitor to Pin 2 on AM circuit board	CW	Signal strength meter.	Normal.	Pri. & Sec. cores of T201 & T202.	Maximum possible indication.	As the tuner output increases, attenuate generator output to keep meter indication below 4.
2	600kHz	600kHz	Through a 200pF capacitor to ant. terminals.	Same	Same	Same	L203 (oscillator coil.)	Same	Same as Step 1.
3	1400kHz	1400kHz	Same	Same	Same	Same	C210 (oscillator trimmer)	Same	Repeat Steps 2 & 3 until dial calibration is accurate.
4	600kHz	600kHz	Same	Same	Same	Same	L201 (AM antenna rod) & L202 (AM-RF)	Same	Same as Step 1 except adjust generator so that output signal is just above the noise level. Position antenna rod away from chassis and nearby objects.
5	1400kHz	1400kHz	Same	Same	Same	Same	C201 (AM antenna trimmer) & C204 (AM-RF trimmer).	Same	Repeat Steps 4 & 5 until output is as high as possible.
6	1000kHz	1000kHz	Same	30% @ 400Hz	Distortion Analyzer.	L or R output.		With a distortion analyzer, the following measurements can be performed: 1. With a 10mV input signal adjust "AM Level" control for 0.3 volts of audio output at tape-outputs. This will correspond to 1.0 volt audio output for a 100% modulated signal. 2. With a 1mV input signal, harmonic distortion, whistle filter attenuation at 10kHz modulating frequency and signal to noise ratio may be measured. 3. IHFM sensitivity of 75 microvolts for 20dB signal to noise ratio. (This measurement is only possible in the absence of man-made interference, as fluorescent lamps, etc.)	

FM ALIGNMENT

STEP	TUNER DIAL SETTING	SIGNAL GENERATOR			INDICATOR		ADJUST	TEST LIMITS	REMARKS
		FREQ.	COUPLING	MODULATION	TYPE	CONNECTED TO			
1	Point of no interference or signal	10.7MHz	Through external .01µF capacitor to Pin #3 of FM-IF-MPX PC Board.	CW	VTVM	TP #2.	Top (Sec.) Core of T101.	Adjust for zero volt.	Turn muting off for alignment tests.
2	Same	Same	Same	Same	Same	Junction of R117-118.	Bottom (Pri.) core of T101.	Maximum possible negative voltage.	If a distortion analyzer is available, omit this step. Adjust T102 Primary after Step 5. At that time, use a 1mV signal from an FM generator, modulate 100% @ 400Hz. Adjust primary of T102 for minimum distortion. Should be less than 0.3%.
3	105MHz	105MHz	300Ω antenna terminals w/* matching network.	100% @ 400Hz.	VTVM connected to TP#1 and oscilloscope connected to L or R tape output.		Oscillator trimmer C10.	Maximum negative voltage at TP#1.	As TP#1 voltage increases, reduce output of signal generator to keep TP#1 voltage at a low level (less than -.75 volt).
4	90MHz	90MHz	Same	Same	Same		Oscillator Coil L4.	Same	Repeat Steps 3 and 4 until dial calibration is accurate.
5	Same	Same	Same	FM ±300kHz sweep at 60Hz rate.	Oscilloscope.	TP #1.	Top (Pri.) and Bottom (Sec.) cores of T2.	Optimum symmetry about 10.7 MHz.	Connect scope for overall response display. Hold the signal generator output to a low level such that the DC voltage at TP #1 is less than -0.5 volt.
6	105MHz	105MHz	Same	100% @ 400Hz.	VTVM connected to TP #1 and scope connected to L or R tape output.		Mixer, RF-2, RF-1 trimmers C8-6-2.	Maximum negative voltage at TP#1.	Same as Step 3.
7	90MHz	90MHz	Same	Same	Same		Mixer, RF-2, and RF-1; coils L3, 2,1.	Same	Same as Step 3. Then repeat Steps 6 and 7 until TP#1 voltage is as high as possible for the least signal input at both alignment frequencies.
8	Same	Same	Same	Same	VTVM connected to TP#1 and a harmonic distortion analyzer to L or R output.				This step is an overall sensitivity check. Reduce input signal to the point where total noise and distortion reads 3% (-30dB). The input signal will then be the usable

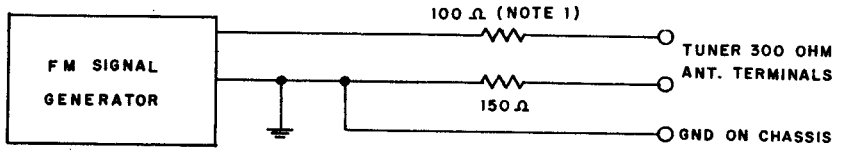
6								modulated signal. 2. With a 1mV input signal, harmonic distortion, whistle filter attenuation at 10kHz modulating frequency and signal to noise ratio may be measured. 3. IHFM sensitivity of 75 microvolts for 20dB signal to noise ratio. (This measurement is only possible in the absence of man-made interference, as fluorescent lamps, etc.)

FM ALIGNMENT

STEP	TUNER DIAL SETTING	SIGNAL GENERATOR			INDICATOR		ADJUST	TEST LIMITS	REMARKS
		FREQ.	COUPLING	MODULATION	TYPE	CONNECTED TO			
1	Point of no interference or signal	10.7MHz	Through external .01µF capacitor to Pin #3 of FM-IF-MPX PC Board.	CW	VTVM	TP #2.	Top (Sec.) Core of T101.	Adjust for zero volt.	Turn muting off for alignment tests.
2	Same	Same	Same	Same	Same	Junction of R117-118.	Bottom (Pri.) core of T101.	Maximum possible negative voltage.	If a distortion analyzer is available, omit this step. Adjust T102 Primary after Step 5. At that time, use a 1mV signal from an FM generator, modulate 100% @ 400Hz. Adjust primary of T102 for minimum distortion. Should be less than 0.3%.
3	105MHz	105MHz	300Ω antenna terminals w/* matching network.	100% @ 400Hz.	VTVM connected to TP#1 and oscilloscope connected to L or R tape output.		Oscillator trimmer C10.	Maximum negative voltage at TP#1.	As TP#1 voltage increases, reduce output of signal generator to keep TP#1 voltage at a low level (less than -.75 volt).
4	90MHz	90MHz	Same	Same	Same		Oscillator Coil L4.	Same	Repeat Steps 3 and 4 until dial calibration is accurate.
5	Same	Same	Same	FM ±300kHz sweep at 60Hz rate.	Oscilloscope.	TP #1.	Top (Pri.) and Bottom (Sec.) cores of T2.	Optimum symmetry about 10.7 MHz.	Connect scope for overall response display. Hold the signal generator output to a low level such that the DC voltage at TP #1 is less than -0.5 volt.
6	105MHz	105MHz	Same	100% @ 400Hz.	VTVM connected to TP #1 and scope connected to L or R tape output.		Mixer, RF-2, RF-1 trimmers C8-6-2.	Maximum negative voltage at TP#1.	Same as Step 3.
7	90MHz	90MHz	Same	Same	Same		Mixer, RF-2, and RF-1; coils L3, 2,1.	Same	Same as Step 3. Then repeat Steps 6 and 7 until TP#1 voltage is as high as possible for the least signal input at both alignment frequencies.
8	Same	Same	Same	Same	VTVM connected to TP#1 and a harmonic distortion analyzer to L or R output.				This step is an overall sensitivity check. Reduce input signal to the point where total noise and distortion reads 3% (-30dB). The input signal will then be the usable sensitivity and should be less than 2.5µV.

MULTIPLEX DECODER ALIGNMENT

STEP	TUNER DIAL SETTING	SIGNAL GENERATOR			INDICATOR		ADJUST	TEST LIMITS	REMARKS
		FREQ.	COUPLING	MODULATION	TYPE	CONNECTED TO			
1	100MHz	100MHz	300Ω antenna terminals w/ approx. 1000 microvolts signal w/* matching network.	75kHz deviation @ 67kHz.	AC-VTVM or oscilloscope w/very low cap. probe.	Pin 13 on MPX/IF PC Board.	L104 and L105 (SCA adj.)	Minimum output @ L or R output jack.	Adjust for minimum 67kHz output.
2	Same	Same	Same	19kHz stereo pilot.	Same	Pin 14 on MPX/IF PC Board	L106 (19kHz phase adj.) & T102 (19 kHz transformer.)	Adjust for maximum AC voltage.	Decrease pilot level, if necessary, so that 19kHz circuits do not limit or saturate.
3	Same	Same	Same	Same	Same	T103, Pin 1 or 2.	T103 top (Pri.) & bottom(Sec.) tuning cores	Adj. for maximum AC voltage.	Decrease pilot level so that 19kHz and 38kHz circuits do not limit. Mode switch must be in stereo position.
4	Same	Same	Same	1kHz (100% modulation) L or R only, pilot level normal and on.	AC-VTVM	L or R output jack.	T103, Bottom (Sec.) tuning cores.	35dB separation or more.	Modulate left channel and measure right channel output. Adjust bottom tuning core (Sec.) for minimum right channel output (maximum separation). Then, reverse channels and measure left channel separation. For this adjustment and measurement, no test lead should be connected to TP #2.
5	Same	Same	Same	Same	Same	Same		Less than 15mV of residual.	Adjust "FM Level" control (R126) for 1 volt of audio output at tape output jacks. Then, turn off the modulation and measure the residual of the 19kHz and 38kHz frequencies.



Note 1: If signal generator has other than 50 ohm internal impedance, use a resistor of 150 ohms less internal generator impedance.

REPLACEMENT PARTS

All parts not listed are common items obtainable from radio parts jobbers.

Replacement parts may be obtained when ordered by PART NUMBER from:

McIntosh Laboratory, Inc.
Customer Service Department
2 Chambers Street
Binghamton, New York 13903
(telephone 607-723-3512)

CAPACITORS

Symbol Number	Description			Part Number
C19	Mylar	0.1μF	100V	064-098
C22	Mylar	0.1μF	100V	064-098
C108	Elect.	10μF	50V	066-221
C116	Ta. Elect.	1μF	35V	066-147
C120	Ta. Elect.	1μF	35V	066-147
C123	Ta. Elect.	3.3μF	35V	066-170
C125	Polystyrene	2700pF	63V	064-093
C127,128	Polystyrene	4700pF	63V	064-091
C134	Polystyrene	3300pF		064-090
C136	Elect.	100μF	25V	066-161
C137	Ta. Elect.	1μF	35V	066-147
C139	Polystyrene	3300pF		064-090
C202	Polystyrene	4700pF	63V	064-091
C203	Ta. Elect.	1.5μF	35V	066-158
C207	Ta. Elect.	3.3μF	35V	066-170
C218	Polystyrene	2700pF	63V	064-093
C220	Elect.	100μF	25V	066-161
C301,302	Mylar	0.47μF	250V	064-069
C305,306	Ta. Elect.	10μF	50V	066-221
C307,308	Ta. Elect.	10μF	63V	066-178
C313,314	Mylar	0.47μF	250V	064-069
C315,316	Ta. Elect.	100μF	16V	066-177
C317,318	Polyester	0.01μF	250V	064-101
C319,320	Mylar	0.47μF	250V	064-069
C325,326	Polyester	0.01μF	250V	064-101
C329,330	Polyester	0.022μF	250V	064-102
C333,334	Ta. Elect.	100μF	16V	066-226
C335,336	Mylar	0.22μF		064-068
C337,338	Mylar	0.047μF		064-066
C339,340	Mylar	0.22μF		064-068
C341,342	Mylar	0.01μF	250V	064-040
C343,344	Mylar	0.01μF	250V	064-040
C351,352	Mylar	0.47μF	250V	064-069
C353,354	Ta. Elect.	0.47μF	50V	066-174
C356	Ta. Elect.	1μF	35V	066-147
C357,358	Mylar	0.22μF	250V	064-043
C359,360	Mylar	0.22μF	250V	064-043
C401,402	Elect.	150μF	63V	066-205
C403,404	Elect.	100μF	16V	066-226
C419,420	Elect.	10μF	35V	066-173
C427,428	Ta. Elect.	1.5μF	35V	066-158
C503,504	Elect.	9300μF	50V	066-162
C505	Elect.	80/80/50/150μF 200/200/150/150V		066-095
C506	Elect	200/200/1000μF 100/100/20V		066-172
C507	Mylar	1μF	250V	064-088
C508,509	Mylar	0.22μF		064-096
C510	Elect.	100μF	40V	066-206
C515,518	Elect.	150μF	63V	066-205

DIODES

D1	Ge. signal diode	070-003
D101,102	Ge. signal diode	070-003
D103,104	Ge. signal diode	070-003
D105,106	Si. signal diode	070-047
D107,108	Si. signal diode	070-047
D109,110	Si. signal diode	070-047
D201	Si. signal diode	070-047
D202	Ge. signal diode	070-003
D203	Si. signal diode	070-046
D401,402	Si. signal diode	070-047
D403,404	Si. diode	070-046
D405,406	Si. signal diode	070-047
D407,408	Si. signal diode	070-047
D409,410	Si. diode	070-031
D411,412	Si. diode	070-031
D413,414	Ge. PNP transistor	132-098
D421,422	Zener diode	070-085
D423,424	Zener diode	070-085
D501,502	Si. diode	070-031
D503,504	Si. diode	070-041
D505,506	Si. diode	070-041
D507	Zener diode 16V	070-048
D509	Zener diode 75V	070-025
D510	Bridge rectifier	070-044

CHOKE & COILS

L1	1st RF coil		122-109
L2	2nd RF coil		122-108
L3	Mixer coil		122-107
L4	Oscillator coil		122-106
L5	Choke	75μH	122-013
L8	Choke	0.47μH	122-010
L101,102	Choke	75μH	122-013
L103	Choke	1MH	122-092
L104,105	Filter coil (SCA)		122-093
L106	Filter coil (19kHz)		122-094
L201	AM antenna		122-110
L202	AM RF coil		122-086
L203	AM oscillator coil		122-085
L204	Choke	1.2μH	122-011
L401,402	Choke	4μH	122-105

TRANSISTORS

Q1	Si. M.O.S. F.E.T.	132-088
Q2	Si. Junction F.E.T.	132-049
Q3	Si. NPN transistor	132-087
Q4	Si. Junction F.E.T.	132-049
Q101	Si. NPN transistor	132-077
Q102	Si. PNP transistor	132-074
Q103,104	Si. NPN transistor	132-077
Q105	Si. NPN transistor	132-077
Q106	Si. NPN transistor	132-075
Q201,202	Si. NPN transistor	132-082
Q203	Si. NPN transistor	132-082
Q204	Si. NPN transistor	132-090
Q301,302	Si. PNP transistor	132-096
Q303,304	Si. PNP transistor	132-096
Q305,306	Si. NPN transistor	132-095
Q307,308	Si. NPN transistor	132-093
Q309,310	Si. NPN transistor	132-093
Q311,312	Si. NPN transistor	132-093
Q313,314	Si. NPN transistor	132-095
Q315,316	Si. NPN transistor	132-095
Q317,318	Si. NPN transistor	132-095
Q401,402	Si. PNP transistor	132-096
Q403,404	Si. PNP transistor	132-096
Q405,406	Si. NPN transistor	132-081
Q407,408	Si. NPN transistor	132-021
Q409,410	Si. PNP transistor	132-032
Q411,412	Si. NPN transistor	132-080
Q413,414	Si. PNP transistor	132-079
Q415,416	Si. NPN transistor	132-070
Q417,418	Si. NPN transistor	132-070
Q501	Si. NPN transistor	132-078
Q502	Si. PNP transistor	132-032
Q503	Si. NPN transistor	132-078

FUSES

F401,402	Fuse	5A	089-014
F403,404	Fuse	5A	089-014
F501	Fuse	3.2A slo-blo	089-006

POTENTIOMETERS

R312	Balance control	134-230
R313	Volume control	134-229
R314	Treble control	044-270
R315	Bass control	044-269

RESISTORS

R401,402	Wirewound	8.2k	5W	139-106
R433,434	Wirewound	0.33Ω	5W	139-080
R435,436	Wirewound	0.33Ω	5W	139-080
R504	Wirewound	600Ω	5W	139-043
R510	Wirewound	1.5k	5W	139-079
R512	Wirewound	220Ω	5W	139-009
R517	Wirewound	300Ω	5W	139-098

SWITCHES

S301	Input selector switch	146-149
S302	Mode selector switch	150-008
S303	Mode selector switch	150-007
S502,503	Thermo cut-out switch	153-007
S504	Impedance selector	149-007

TRANSFORMERS

T1	Balun	043-226
T2	FM IF input	162-057
T101	Discriminator	162-036
T102	RF (19kHz)	162-055
T103	RF (38kHz)	162-054
T201,202	AM IF transformer	162-050
T501	Power transformer	159-111

THYRISTORS & TRIGGERS

TR401,402	Triac	131-005
SBS401,402	Bilateral switch	131-004

METERS

M301	Signal strength meter	124-017
M101	Tuning meter	124-016

	Choke	75µH	122-013
	Choke	0.47µH	122-010
,102	Choke	75µH	122-013
	Choke	1MH	122-092
,105	Filter coil (SCA)		122-093
	Filter coil (19kHz)		122-094
	AM antenna		122-110
	AM RF coil		122-086
	AM oscillator coil		122-085
	Choke	1.2µH	122-011
,402	Choke	4µH	122-105

TRANSISTORS

	Si. M.O.S. F.E.T.	132-088
	Si. Junction F.E.T.	132-049
	Si. NPN transistor	132-087
	Si. Junction F.E.T.	132-049
	Si. NPN transistor	132-077
	Si. PNP transistor	132-074
,104	Si. NPN transistor	132-077
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,306	Si. NPN transistor	132-095
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,404	Si. PNP transistor	132-096
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